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## REMARKS

### Interview

A telephone interview was held with the Examiner on February 1, 2005. The courtesy extended by the Examiner is greatly appreciated.

To summarize the substance of the interview, applicants' representative commented that the symbol "e" in the expression " $e \log_e M$ " is clearly understood by all readers to represent the natural algorithm of M multiplied by the natural logarithm constant, which is approximately 2.7. As best understood, the Examiner asserted that there is some confusion in the specification as to whether "e" stands for the natural logarithm number, or a probability measure.

As for the outstanding 35 USC 101 issue, the Examiner stated that what he is looking for is some post solution activity (supportable by the specification, of course). The Examiner agreed that his Office action did not directly address applicants' argument in the first Office action response. This, alas, leaves applicants at a loss as to which portion of applicants' argument was unconvincing, and why. Applicants hope that the remarks below, taken together with a reconsideration of the remarks in the previous Office action response, will be found to be convincing.

Applicants' representative stated that an affidavit to overcome the 35 USC 102 rejection will be submitted.

In a subsequent call by the Examiner, the rejection of claim 1 under 35 USC 112 was discussed. It appeared to applicants' representative that the Examiner now properly understands the language of claim 1 and will withdraw the rejection.

### 35 USC 112 matters

#### Items 2 and 4 of the Detailed Action

Applicants appreciate the withdrawal of the 35 USC 112 rejection,

#### Item 3 of the Detailed Action

The 35 USC 112, second paragraph, rejection of claims 7, 8, and 14 is maintained because, according to the Examiner, "it is unclear as to who or what is 'carried out'." Applicants respectfully traverse.

Claim 1 specifies that the method is one that simulates a physical system. Claim 1 further specifies that the method is executed in hardware that comprises N processing

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elements. Claim 1 still further specifies that the simulating of the physical system is assigned to the N processing elements. Therefore, **every step that pertains to the simulation method is executed, or carried out in the processing elements.** Stated differently, whatever details (of the claimed method) are specified in the claims that depend on claim 1, by virtue of the claim 1 limitations such steps must be carried out in the processing elements of the hardware. It is respectfully submitted that this overcomes the rejection.

However, in order to advance prosecution, claims 7 is amended to specify that the carrying out is in each PE.

Although it is believed that this amendment is unnecessary because it merely cumulatively adds to that which is already in the claims by virtue of limitations found in the parent claim 1, it is believed that it certainly overcomes the rejection. At the very least, it places the case in better condition for appeal. Moreover, this amendment – in combination with the other remarks herein – places the case in condition for allowance and, therefore, for a number of reasons this amendment does not constitute a reason for not admitting this Response into the Record.

Claim 8 does not specify anything as being “carried out,” so the Examiner’s reason for rejecting claim 8 does not appear to be valid. The same holds true for claim 14.

A review of claim 14, however, did reveal a typographical error, and this error is corrected. It is respectfully submitted that correcting the typographical error of claim 14 does not require a new search, certainly places the case in better condition for appeal, should one be necessary, and therefore it does not constitute a reason for not admitting this Response into the Record.

Items 8 and 9 in the Detailed Action

Claim 1 is (presumably) rejected under 35 USC 112, first paragraph because, according to the Examiner, the claim is indefinite in that it is “unclear whether the limitations following the phrase are part of the claimed invention.

Applicants respectfully traverse.

The Examiner’s reasoning is somewhat unclear because everything in the claim, and certainly everything that follows the preamble, is “part of the claimed invention.”

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That means that "the limitation following the phrase" are definitely part of the claimed invention.

The Examiner has not indicated what gives rise to the alleged lack of clarity. As indicated above, in a telephone conversation with the Examiner applicants' representative pointed out that the claimed method is for simulation. That the simulation is of a physical system, in contradistinction to, for example, a system of equations. The defined method comprises a number of steps, and those are defined in the claim. It is respectfully submitted that no ambiguity exists.

**35 USC 101 matters**

**Items 5, 10, and 11 in the Detailed Action**

The rejection of (apparently of claims 1-20) under 35 USC 101 is maintained. In item 5 the Examiner asserts that the rejection stands because "the application is clearly is an abstract of mathematical events with no consistent concrete result of post-solution activity." In item 10 the Examiner asserts that the claims are not tangible because they "appear to recite a mathematical algorithm namely the discrete element parallel simulation is confined or limited space that doesn't have specific preprocessing or post solution activity." Applicants respectfully traverse.

First, applicants respectfully disagree that the application presents merely "an abstract of mathematical events." The specification clearly states that it relates to simulation of a system. Explaining, the specification teaches that the design of many systems can benefit from simulations. One example that is mentioned is simulation of a drug (which on the surface appears to be a single system). Another simulation that is mentioned is of a material. Yet another simulation that is mentioned is of the AT&T switched network. See page 1, lines 3-23. These are examples of actual, physical, systems that the method of this invention can be employed to simulate. Further, the detailed description is presented in terms of a simulation of the behavior of a particular ferromagnetic material in response to the application of a magnetic field. The important point to note is that the method pertains to a simulation of a physical system, and not to some abstract mathematical computations.

The claimed method is one of simulation a system on a hardware device, such as a computer. When carried out in a computer hardware device, any simulation (or any other

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activity, for that matter) involves an algorithm. However, the invention is NOT directed to that algorithm. No algorithm for simulating a particular system is claimed.

Second, the issue at hand is NOT what the application describes, but what the claims define. It is respectfully submitted that what is claimed is the method of simulating a system on hardware that comprises M processing elements which communicate with each other. Applicants are not sure what meaning to attach to the Examiner's expression "abstract of mathematical events" is, but as best understood, claim 1 is not an "abstract of mathematical events."

The method defined in claim 1 specifies two steps. The first step is one of assigning events to be simulated. That is plainly not a mathematical step. The second step is one of simulating events in blocks of M edge events. This also is not a mathematical step, although the claim does specify a mathematical expression for the value of M ("approximately  $e \log_e N$ "). However, evaluating this expression is NOT part of the defined claim. The claim only specifies what that value is. That is, for purposes of this method, the value of M is merely a constant, and the language

...include M edge events, where M is approximately  $e \log_e N$ , e is approximately 2.71828...

is – from the standpoint of 35 USC 101 – no different from

...include M edge events, where M is 100....

Moreover, even if the evaluation of M were part of the method, specifying a value for M does not convert the step for simulating a system into a step for computing M, and it certainly does not convert the step for simulating a system the step into an abstract mathematical algorithm; and it certainly does not convert the entire method into an abstract mathematical algorithm.

Viewed another way, there is absolutely no way to argue that claim 1 somehow preempts the notion of computing the value of  $e \log_e N$ .

Third, aside from the fact that claim 1 does not specify – directly or indirectly – any mathematical algorithm, and does not pre-empt any mathematical algorithm, it is not true that there is no "specific preprocessing or post solution activity." To wit, as indicated above, it is clear that the step of

assigning events of said physical system that are to be simulated to each of N processing elements (PEs)

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is not a mathematical step. It is also clear that the activity of assigning events necessarily precedes anything that the PEs might do with the events. Therefore, even if there were any mathematical computations that are performed by subsequent steps of claim 1 (which the above remarks demonstrate that there are not), this step of assigning would be *preceding* those subsequent steps. Therefore, the step of "assigning events of the physical system... to each of the N processing elements" is *clearly a preprocessing activity*.

Fourth, the Examiner's attention is respectfully directed to applicants' arguments in the previous Office Action response that demonstrates claim 1 to be within the "safe harbor" of patentable claims.

Fifth, in the aforementioned interview the Examiner said that he would have liked to see the claim include a post solution activity step, provided that such a step find support in the specification. Alas, simulation of an actual physical system does not have an preordained end. Simulating a telephone network, for example, has a preprocessing activity – that of entering the proper information into the simulating hardware (and which applicants' claim specified), but the actual simulation can continue as long as one wishes. The party controlling the hardware that does the simulating can *at any time* choose to see what the current state of the network is, but that does not represent any end, or termination. One can perhaps obtains some statistical insights into the characteristics of the system that is being simulated, and such statistical values that provide the insights can be computed at any time, but (a) that is NOT the invention, and (b) there is no point of "post solution activity." The invention is merely simulating a selected system in successive blocks of M events. There is nothing mathematical about it.

In short, applicants respectfully submit that the rejection of claim 1 under 35 USC 101 is inappropriate, and so is the rejection of all claims that depend on claim 1.

### **35 USC 102 matters**

#### **Items 6, 12 and 13 in the Detailed Action**

The rejection of claims 1-20 under 35 USC 102 as being anticipated by Lubachevsky et al "Synchronous Relaxation for Parallel Simulations with Applications to Circuit-Switched Networks," is respectfully traversed.

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In item 6 the Examiner asserts that "the applicant extracted and massaged the prior art so the claims do not, match what the prior art teaches verbatim." *This statement skirts very closely to an outright assertion of wrong doing on the part of applicants, and applicants object.*

Applicants have not hidden the fact that the reference cited by the Examiner (which applicants refer to as the "Eick et al" reference) is related. Indeed, this reference is discussed at page 1 of the specification. Applicants have faithfully described the teachings of that article. Applicants have also properly pointed to the distinctive difference between the Eick et al reference and the instant invention. For example, at page 5, lines 9-11, the specification states that "the simulation takes place in blocks of a given number of edge atom events (rather than in time intervals  $\Delta$  as in the Eick et al article). This difference is not merely an "extracting" or a "massaging." Also as pointed out at page 5, lines 20-25, of the specification

Carrying out the simulation in terms of blocks of M edge atom events, where M is related to the number of PEs, N, rather than in time intervals of duration  $\Delta$  results in significantly different simulation details. More importantly, the mathematical characteristics of such an approach are considerably different from those in the Eick et al article and, consequently, the Eick et al article does not lead to a conclusion that such a simulation approach would succeed with equal efficiency. It can be shown, however, that the simulation process disclosed herein does operate quite efficiently, taking on the order of  $\log M$  iterations to complete.

Based on the above, it is respectfully submitted that to assert that applicants extracted and massaged the prior art so the claims do not match what the prior art teaches verbatim, is patently wrong. Moreover, it is **baseless**. Because it is tantamount to asserting an attempted conversion (in that the entity consisting of Lubachevsky and Weiss allegedly attempted to obtain a patent for that which was taught by an entity that included Eick and Greenberg) – and conversion is a tort –, applicants respectfully request a retraction.<sup>1</sup>

The Examiner continues at point 6 to assert that applicants argued that "there is no mention of the exponential "e" with  $M/\log M$  and that such an assertion is not true.

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<sup>1</sup> This matter was raised with the Examiner when the Examiner called, and he assured the undersigned that there was absolutely no attempt to allege any wrong doing. Still, the record needs to be clean.

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Applicants' representative was unable to find such an assertion in the previous Office action response. What applicants argued (in part) is the following

claim 1 specifies that the value of M is "approximately $e \log_e N$ ," where N is the number of PEs. In contradistinction, the cited reference teaches that the time interval $\Delta$ that is "on the order of" $M/\log M$ ."	This is not an assertion that there is no mention of the exponential "e" with $M/\log M$ . By the way, the Examiner has made no comments to dispute this assertion.
First there is clearly no correspondence to a time interval selection and to a selection of a number of event	ditto
Second " $M/\log M$ " is not a teaching or even a suggestion of " $e \log_e N$ "	To say that $M/\log M$ is not the same as $e \log_e M$ is factually correct, and is not tantamount to an assertion that there is no mention of the exponential "e".
Third, "approximately" is <i>different</i> from "on the order of."	This is not an assertion that there is no mention of the exponential "e" with $M/\log M$ . Again, the Examiner has made no comments to dispute this assertion.

In short, it appears that the Examiner has misunderstood applicants' arguments.

Reconsideration is respectfully requested.

The Examiner continues in item 6 to assert that "The applicant states no mention of the term  $(i-1)\Delta, i\Delta$ ." Again, applicants' representative was unable to find that such an assertion was made in the previous Office action response. In fact, applicants admitted that "The first passage (page 289, lines 1-8) teaches that during each iteration a PE constructs the sequence of events of its subsystem during the interval  $(i-1)\Delta$  and  $i\Delta$ ", and assert that the cited paragraph offers "no definitive language in this passage that dictates the nature of the interval;" meaning the duration of the interval. Respectfully, this assertion by applicants is factually correct. Applicants also stated that "the third passage (page 293, lines 7-14) teaches that the events within the  $i^{\text{th}}$  time step  $[(i-1)\Delta, i\Delta)$  are computed iteratively."

In short, it appears that the Examiner has misunderstood applicants' arguments.

Reconsideration is respectfully requested.

Additionally, in item 6 the Examiner said that "applicants' state the prior art fails to mention M edge events, which are taught in the specification, which draws comparisons between energy of the atom and probability." This sentence is unclear

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because it fails to separate that which the Examiner asserts to be the applicants' statement, and the Examiner's analysis. It is true that the prior art fails to mention M edge events, or any edge event. However, applicants have **not** made the statement attributed by the Examiner. Rather, what applicants argued that

the nature of a simulation process in accord with the teachings of the cited article is different from the nature of the simulation process in accord with claim 1, which a "simulation step where each processing element (PE) simulates assigned events in blocks that include M edge events."

Also, applicants have not asserted that the edge events draw "comparisons between energy of the atom and probability." It is possible that the Examiner is not asserting that applicants have made this statement, and that this statement is the Examiner's conclusion. This conclusion, however, is wrong. Neither the value of M nor the notion of edge events is actually related to the energy of an atom, or to probability. It should be kept in mind that the atoms example is just that: an example. The notion of edge events is rooted in the independent workings of the PEs. The Examiner's attention is respectfully directed to the teachings at page 4 of the specification (observations 3 and 4). To review, in the illustrative example of the disclosure, the material subareas are divided into areas, *and each area is assigned to a PE.* What occurs to atoms at edges of the subareas depends on adjacent subareas. Therefore, simulations relative to these atoms are uncertain until information from simulations of adjacent subareas is provided. In other words, edge events are events in a PE whose simulations are uncertain (possibly in error) until information from adjacent PEs is provided. To repeat, the notion of edge events *per se* has nothing to do with atoms. Atoms are mentioned in the specification simply because that is the illustrative system that is being simulated.

Still additionally, in item 6 the Examiner apparently admits that the reference does not teach edge events but "counters this minute point with the finding of teaching found in the prior art on page 292, lines 13-15." Respectfully, the Examiner is in error on two counts. First, the difference pointed out by applicants and admitted to by the Examiner is not a "minute" point, and respectfully, there is no basis for the Examiner's characterization of the difference is "minute." In fact, it is respectfully submitted that defining a set in terms of a number edge events, rather than in terms of all events, or in terms of events in a given period of time (which is what the reference teaches) is **not** a



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minute difference. There are distinct and important consequences to this difference, as applicants' specification described. The Examiner attempt to draw support for his assertion of "minute" difference by referring to boundaries mentioned in page 292 of the reference. These boundaries are arbitrary load class boundaries. They pertain to the "Aggregated Lease Busy Alternative" policy, and have nothing to do with simulating events in different PEs. In other words, other than the superficial similarity between the term "edge" and the term "boundary" the two terms in their respective treatises are employed in totally different contexts.

Second, when there is a difference, a rejection under 35 USC 102 is inappropriate. It is precisely for occasions where the difference between the prior art and the invention is small that 35 USC 103 came into being. It is respectfully submitted that, based on the Examiner's admission of a difference (albeit, allegedly "minute") the rejection under 35 USC 102 must be withdrawn.

Note: the Examiner's last sentence in item 6 is, regretfully, not understood and, therefore, cannot be addressed and rebutted.

Lastly, applicants respectfully submit an affidavit under Rule 132. It is believed that the affidavit clearly overcomes the 35 USC 102 and 112 rejections.

**New matter in the Specification**

**Item 7 the Detailed Action**

The Examiner asserts that the addition of the explanatory phrase as to the meaning of "e" is new matter. Respectfully, applicants traverse.

When a specification is amended, it might introduce new matter, but it can also explain, or further elaborate on, matter that is already in the specification. The former is prohibited, whereas the latter is allowed.

Applicants respectfully assert, and the enclosed affidavits supports applicants' assertion, that the teachings in the specification are such that all readers would understand that  $\log_e M$  means the "natural logarithm" of M, and that " $e \log_e M$ " means the natural logarithm of M multiplied by the logarithmic constant whose first 6 digits are 2.71828. In fact, it is noted that – based on the Examiner's own comment regarding "e" in the reference – that the Examiner views the expression  $M/\log M$  as employing log to the base  $e$ .

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In view of the above amendments, remarks, and the affidavit, applicants respectfully submit that all of the Examiner's rejections have been overcome. Reconsideration and allowance are respectfully solicited.

Respectfully,  
Boris Dmitrievich Lubachevsky  
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Dated: 2/2/05

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